Remarks: Claims

The Claims 1-3, 5-9, 11, 16, and 17 were amended to better distinguish the invention over the prior art, to correct minor typographical errors, to recite terminology that is better supported by the disclosure, and to correct informalities noted by the Examiner.

The Claims 4 and 10 were cancelled.

Claim 1 was amended to include the terms "spread information signal" (which is recited on page 17, line 16) and "despreading signal" (which is recited on page 18, line 14).

Claim 16 was amended to include the term "despreading signal" (which is recited on page 18, line 14).

Remarks: Drawings

New drawing sheets 1, 3, 4, 6, 7, and 8 are included, with proposed corrections as required by the Examiner.

Amendments to the Specification

Please rewrite the third paragraph on page 18 as follows:

FIG. 10A shows a spread-spectrum communication system that transmits a despreading signal having a time offset Δt_i from a transmitted spread-spectrum signal. Components shown in FIG. 10A are similar to the components listed in FIG. 9B. The modulator 94 modulates an information signal $s_n(t)$ from an information-signal source 90 onto a wideband signal generated by a wideband-signal source 92 for providing a spread-spectrum signal. The wideband signal may be any type of coded or noise signal. The wideband-signal source 92 and the modulator 94 are coupled to a transmitter 99. A wideband signal from the wideband-signal source 92 is delayed by at least one delay element, such as delay element 96.1, before being coupled into the transmitter 99. The transmitter 99 couples the spread-spectrum signal and the delayed wideband signal into a communication channel. The spread-spectrum signal may be delayed. For example, a delay element (not shown) may be coupled between the modulator 94 and the transmitter 99 instead of (or in addition to) the delay element 96.1 shown in FIG. 10A. At a receiver, at least one sample of the received transmission signal is delayed by an amount Δt_i in a correlator processor 169. The correlator processor 169 then matches the time-offset wideband signal to a desired spread-spectrum signal and thereby reproduces the embedded information-bearing signal as an output.

Remarks: Specification

The reference number 96, which is referred to as a delay element in Figure 10A, was changed to 96.1 in order to comply with the Examiner's recommendation. Although the delay element is a type of diversity encoder (which is also depicted by reference number 96), it is a specific example of a diversity encoder.

Remarks: Examination Report

1. Section 1 of the Examination Report

Applicant elected claims 1-13, 16, and 17 without traverse.

2. Section 2 of the Examination Report

The objection to the drawings is noted.

a. The elements in the figures 1, 5A-5F, 9A-9E, 10A-10E, 11, 12A, 12B, and 13 were labeled, as required by the Examiner.

b. The symbols θ_i and d were included in figures 4A and 4B, as required by the Examiner.

c. Arrows were added to connections in Figure 10A (as well as figures 10B-10E) to better illustrate the signal flow described in the specification. With regard to Figure 10A, the modulator 94 modulates an information signal $s_n(t)$ from an information-signal source 90 onto a wideband signal generated by a wideband-signal source 92 for providing a spread-spectrum signal (page 18, lines 15-18). A wideband signal from the wideband-signal source 92 is delayed by at least one delay element, such as delay element 96, before being coupled into the transmitter 99 (page 18, lines 19-21). This amendment should make it clear that there is no connection between the output of 94 and the input of 96. Also, the delay element's reference number was changed from 96 to 96.1 in the Figure 10A in order to conform with a correction to the specification required by the Examiner.

d. The Examiner noted that in Figure 14C, the word "into" should be changed to "onto" for clarity. However, Applicant respectfully disagrees with the Examiner on this point. In wireless communications, it is customary to refer to transmitting a signal into a communication channel rather than onto a communication channel. The phrase "into a channel" appears to be more popular than the Examiner's suggestion of "onto a channel." For example, the former phrase appears 32,300 times in a Google search, whereas the latter phrase appears only 578 times.

3. Section 3 of the Examination Report

The specification was amended such that the reference number 96, which is referred to as a delay element in Figure 10A, was changed to 96.1 in order to comply with the Examiner's recommendation.

4. Section 4 of the Examination Report

Claims 7, 8, 13, 16, and 17 were objected to because of specified informalities.

Claims 7 and 13: The Examiner noted that the word "into" should be changed to "onto" for clarity. However, Applicant respectfully disagrees with the Examiner on this point. In wireless communications, it is customary to refer to transmitting a signal into a communication channel rather than onto a communication channel. The phrase "into a channel" appears to be more popular than the Examiner's suggestion of "onto a channel." For example, the former phrase appears 32,300 times in a Google search, whereas the latter phrase appears only 578 times.

Claim 8: The Examiner states that the phrase "the wideband signal" should be "the information-bearing wideband signal." However, in Applicant's record of the claims, Claim 8 reads as follows:

> "8. A method of producing diversity-encoded spread-spectrum signals comprising: generating at least one information-bearing wideband signal, generating at least one decoding signal, and diversity-encoding at least one of the information-bearing wideband signal and the decoding signal."

Furthermore, this claim also appears in this form in the published application no. **20010046255** corresponding to this application. However, Applicant recognizes that Claim 9 has the deficiency noted by the Examiner with regard to Claim 8. Therefore, an appropriate correction was made.

Claim 9: The phrase "wideband signal" was changed to "information-bearing wideband signal."

Claims 16 and 17: The Examiner recommended changing "for generating" to "to generate" for clarification. Applicant respectfully suggests in the amended claims the phrase "configured for generating" in order to be consistent with grammar used elsewhere in the claims 16 and 17.

5. Sections 4-7 of the Examination Report

Claims 8-13 were rejected under 35 U.S.C. 112. In particular, The Examiner noted that in Claim 8, the step of generating at least one decoding signal appears to be inconsistent with a method for producing diversity-encoded spread-spectrum signals. Usually, the decoding signal is generated in the receiver, whereas a transmitter would implement a method for producing diversity-encoded spread-spectrum signals. Furthermore, claim 12 recites modulating the decoding signal onto a carrier signal, whereas the decoding signal is usually in a receiver.

The Examiner points out in Paragraph 7 that the decoding signal is usually generated in the receiver rather than the transmitter. Therefore, the Examiner should appreciate the novelty of the claimed invention in which a decoding signal (i.e., a despreading signal, such as described with respect to Fig. 10A and on Page 17, lines 23-26) is generated at the transmitter and transmitted along with an information-modulated signal so a receiver does not have to generate the decoding signal (e.g., Page 5, lines 1-3). Rather, diversity at the transmitter is employed in such a way that the decoding signal and the information-modulated signal may be separable from each other at the receiver and then combined to demodulate or despread the information-modulated signal. An exemplary embodiment (Fig. 10A) shows a despreading signal being delayed from the information-modulated signal (i.e., the transmission is provided with time diversity) prior to transmission. At a receiver, the decoding signal and the information-modulated signal are combined (e.g., correlated) to "decode, decrypt, or otherwise extract an information signal from a

received signal" (Page 17, lines 23-26). Thus, the receiver need not generate a local decoding signal.

Another benefit of transmitting the decoding signal along with the coded information is that both signals may undergo substantially identical channel distortions. Thus, the claimed invention may employ a much simpler technique for matching the decoding signal to the distortions experienced by the coded information, and the receiver may achieve this without performing equalization or channel emulation.

6. Section 8 of the Examination Report

Claim 10 was rejected under 35 U.S.C. 112. This rejection has been obviated by the cancellation of Claim 10.

7. Sections 9-19 of the Examination Report

Claims 1-4, 6-11, and 13 were rejected under 35 U.S.C. 102(b) as being anticipated by Cafarella (U.S. Pat. No. 5,809,060).

Claims 1, 5, 8, and 11 were rejected under 35 U.S.C. 102(b) as being anticipated by Weerackody (U.S. Pat. No. 5,289,499).

Cafarella (5,809,060) shows a receiver that provides a cross-correlation of a locally generated reference code 49 with the received signal 47 (FIG. 4, col. 13, lines 29-34, FIG. 9, and col. 19 lines 1-3). However, Cafarella does not show a transmitter that generates a despreading or decoding signal (i.e., a reference code) for transmission along with a coded signal.

The Examiner states that Weerackody (5,289,499) discloses generating a decoding signal 63 in FIG. 5. While this is true, the signal generator 63 is shown as part of a Rake receiver, rather than in a transmitter. Thus, like in other well-known prior-art systems, such as Cafarella, the decoding signal is generated locally by the receiver. Weerackody does not show generating a despreading or decoding signal at the transmitter.

Therefore, Applicant submits that a transmission method that generates a despreading signal along with a spread information signal, such as recited in the amended Claim 1, clearly presents novel structure that the cited prior-art references Cafarella and Weerackody do not.

Applicant submits that a transmission method that generates a decoding signal in addition to an information-bearing wideband signal, such as recited in the independent claim 8, also clearly recites a novel feature that is neither described nor anticipated by the cited prior-art references Cafarella and Weerackody.

Furthermore, evidence for such novelty is clearly stated by the Examiner in Paragraph 7 of the Examination Report: "Usually, the decoding signal is generated in the receiver."

Since the amended independent claim 1 clearly presents novel structure that the prior-art references neither describe nor anticipate, the amended independent claim 1, (and hence, the dependent claims 2-3 and 5-7) should be considered patentable under 35 U.S.C. 102.

Since the amended independent claim 8 clearly presents novel structure that the prior-art references neither describe nor anticipate, the amended independent claim 8, (and hence, the dependent claims 9 and 11-13) should be considered patentable under 35 U.S.C. 102.

8. Sections 20-21 of the Examination Report

Claims 16 and 17 were rejected under 35 U.S.C. 103(a) as being unpatentable over Weerackody in view of Dybdal (U.S. Pat. No. 5,781,845).

Weerackody shows a method of transmit diversity that employs an antenna array wherein time-varying weights are applied to array elements such that a receiver in a slowly varying multipath environment does not experience a deep fade for a long period of time. Weerackody states that

"Diversity refers generally to the ability of a communication system to receive information via several independently fading channels. As a general matter, diversity techniques enhance a system receiver's ability to combine or select (or both) signals arriving from these independently fading channels, thus enabling (or facilitating) the extraction of communicated information."

Although Weerackody employs transmit diversity, it is in a manner that is very different from the structure, use, and effect of the claimed invention. In particular, Weerackody deals with adjusting the constructive and destructive interference of replicas of the same signal that result from reflections in a multipath environment. In contrast, the claimed invention provides a relative diversity parameter difference between two different signals (i.e., the spread-spectrum signal and the decoding signal) to enable a receiver to separate the two signals. Rather than just coherently combining similar received signals, such as is taught in Weerackody, the present invention provides for using the received signals (which are different from each other) for decoding (e.g., despreading). Weerackody shows a signal generator 63 as part of a Rake receiver, rather than a transmitter. Thus, like other well-known prior-art systems, the decoding signal is generated locally by the receiver instead of being received along with an information-bearing signal transmitted in a communication channel. Weerackody does not show generating a decoding signal at the transmitter.

Unlike Weerackody and other prior-art references, the present invention does not rely upon transmit diversity providing for independently fading channels. Rather, Applicant's transmitter embodiment shown in FIG. 10A provides a time offset (i.e., time diversity) that does not necessarily guarantee that the decoding signal and the coded information-bearing signal experience independently fading channels. Rather, the claimed invention enjoys certain advantages when the decoding signal and the coded information-bearing signal are sent on channels that experience similar distortion. For example, if the decoding signal experiences the same distortions as the coded information-bearing signal, the decoding signal may represent the matched-filtered decoding signal required to optimally decode the coded information-bearing signal. Since Weerackody requires

independently fading channels in order to provide useful transmit diversity, Weerackody requires an antenna array, whereas Applicant's invention does not. Thus, it would be impossible for Weerackody to anticipate or even suggest the presently claimed invention.

Dybdal (5,781,845) shows a transmitter comprising an antenna array with adaptive weighting circuitry. Dybdal does not show generating a decoding signal at the transmitter for transmission to a receiver.

It should be appreciated that Dybdal primarily teaches the use of beamforming. Beamforming may use transmit diversity, but in a manner that is very different from the structure, use, and effect of the claimed invention. Beamforming methods exploit the phase and directionality of the signal but do not employ a signal structure to assist a receiver in decoding a received transmission. The present invention does exploit signal structure by including a decoding signal in a transmission. Beamforming is restricted to systems that utilize multi-array antennas. The present invention has no such restriction.

Therefore, the combination of Weerackody and Dybdal is incapable of making a spread-spectrum transmitter that is configured to generate a despreading signal along with a spread-spectrum signal, such as recited in the amended independent claims 16 and 17. Neither Weerackody nor Dybdal mention the desirability of transmitting a despreading signal along with a spread-spectrum signal. Therefore, the combination of Weerackody and Dybdal provides no suggestion or motivation for producing the claimed invention.

Furthermore, support for non-obviousness of the claimed invention is clearly stated by the Examiner in Paragraph 7 of the Examination Report: "Usually, the decoding signal is generated in the receiver."

Since the amended independent claims 16 and 17 clearly present novel structure that the prior-art references, in combination, neither describe nor anticipate, Applicant submits that the amended independent claims 16 and 17 should be considered patentable under 35 U.S.C. 103.

9. Conclusion

The Applicant has thoroughly discussed each of the Examiner's rejections. Applicant has amended claims 1-3, 5-9, 11, 16, and 17 and canceled claims 4 and 10. Claims 1-3, 4-9, 11-13, 16, and 17 remain pending in the application. Applicant believes that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution and/or expedite allowance, the Examiner is invited to contact the undersigned.

Very respectfully,

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